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Review Article

Submental/Transmylohyoid Route for Endotracheal Intubation in Maxillofacial Surgical Procedures: A Review

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Abstract:

Patients with severe panfacial injuries usually require long-term airway management. Nasal intubation may be contraindicated in case of nasoorbitoethmoidal fractures and also there may be a need for intraoperative and short-term postoperative intermaxillary fixation to achieve optimum reduction of fractures. The need for unobstructed access to the perinasal area during bimaxillary orthognathic procedures is felt many a time and to avoid a tracheostomy with its attending morbidity, many techniques have evolved that involve a submandibular/transmylohyoid or submental approach for temporary oroendotracheal intubation. In this article, we present our experience of patients by using submental/transmylohyoid route for endotracheal intubation. technique gives the surgeon and the anesthetist comfortable control over their respective domains, is easy to learn and implement in the operating protocol with no added costs.

Key Words: Intubation, orthognathic surgery, panfacial trauma, submental, tracheostomy, transmylohyoid

Introduction

Patients with severe craniomaxillofacial injuries usually require intraoperative intermaxillary fixation (IMF)to achieve optimum reduction of fractures. Oral intubation can interfere with assessment of occlusion, and nasotracheal intubation may lead to complications like cerebrospinal fluid leakage and meningitis when there are also fractures of the base of the skull or nasoorbitoethmoidal fractures.

When performing bimaxillary orthognathic procedures the need for assessing intraoperative occlusion arises many a time and an oral tube would not permit such an access. Furthermore, when putting the alar cinch stitch, there will be distortion of the ala not permitting a proper intraoperative assessment. The problem is complicated more when rhinoplasty is added to the orthognathic procedures.

The last alternative would have been tracheostomy, but it has its disadvantage such as hemorrhage, pneumothorax, pneumomediastinum, injury to recurrent laryngeal nerve and tracheal stenosis. To avoid tracheostomy with its attending morbidity when nasoendotracheal intubation is considered inadvisable, submental/transmylohyoid endotracheal intubation is a useful alternative method, which allows good airway access.

Submental intubation was reported originally by Hernández Altemir F in 1986.[1] It presents undeniable advantages and near zero morbidity as in comparison to tracheostomy in facial trauma patients.

Indications for submental intubation are:

1. Craniofacial traumatic injuries.
2. Patients with minimal neurologic deficit.
3. When short-term intraoperative inter-maxillary fixation is required to establish reduction and rigid fixation of fractures.
4. Patients with large pharyngeal flaps.
5. Combined bimaxillary orthognathic surgeries and rhinoplasty cases.

Contraindications for submental intubation are:

1. Patients with multisystem trauma.
2. Long-term airway support and maintenance required.
3. Known, severe keloid formers.
4. Patients with severe neurological deficits.

Patients and Methods

A total of 9 patients were operated by this team. The reasons for surgery were primarily for correction of facial deformities due to trauma or due to developmental deformities, but also included a few surgeries of development deformities in the maxillofacial skeleton, which necessitated orthognathic surgical procedures (Table 1).

In the trauma series, there were four males and two females all who had fractures of the maxilla and mandible, or a combination of maxilla, mandible and the nasal regions. The people in the orthognathic surgery were for bimaxillary surgery procedures. One case however was for only a mandibular procedure with rhinoplasty. All patients were medically fit for surgery and had no contraindication for anesthesia or surgery. Consent for elective tracheostomy was also obtained from the patients.

Table 1: Patient data and distribution.

Case	Number	Sex disposition	
		Male	Female
Combined trauma to the mid-face and mandible	6	4	2
Orthomorphic surgery (orthognathic + adjuvant soft tissue surgeries)	3	2	1

Technique

Intravenous antibiotic (Augmentin 1.2 g®)is given an hour prior to the procedure. Cephalosporins are preferred in case of know allergy to penicillin.

The patient is anesthetized and a routine orotracheal intubation is performed using a preformed cuffed tracheal tube. The landmark for the extraoral incision would be the modiolus. A line is dropped from the modiolus to the submandibular region. The incision is made in the submandibular region (length ~2 cm). The dissection is carried down in layers until the platsma is breeched. Then a curved artery is pushed into the submandibular space with the curved end close to the bony part of the mandible. The artery is brought to the sublingual space where the mucosa is bluntly dissected, and the artery forceps is visualized well-beyond its hinges. The reservoir cuff is first brought out through the incision by grasping the edges gently without damaging the edges. The blue connector on the orotracheal tube is removed, and the tube is exteriorized through submental incision and reconnected to the ventilator after putting the blue connector. There has been a practice to secure the tube with Dynaplast® to ensure the tube does not slip during the maneuvering intraoperatively.

After the surgical procedure, the blue tube connector is removed, and the cuff is deflated. The tube is pulled out from the extraoral incision. The submental incision is closed in 1 or 2 layers using 3-0 catgut and 3-0 mersilk and the intraoral incision is closed with 3-0 mersilk.

Discussion

Patients with craniomaxillofacial injuries always present as a challenge as there may be massive disruption of the upper airway, and with the anesthetist fighting to share the access with the surgeons for the airway, things tend to get complicated. Traditionally, anesthesia nasal intubation has been the mainstay for all maxillofacial surgical procedures. This has been a tested and a trusted technique for decades and when done correctly has minimal or no complications. This technique is very comfortable for the surgeons for, during most part of the surgery is kept away from the operating field and does not obstruct the surgeon in any way. Care has to be taken that, while extubation proper suctioning of the airway has to be done before releasing the cuff pressure, lest any collection like blood/clots/mucus/saliva in the tracheal regions be aspirated.

Most maxillofacial procedures are centered on a satisfactory occlusion. It becomes compulsory for the operating surgeon to intermittently keep checking the occlusion. In an uncomplicated case where there is a straight forward nasal intubation, the occlusion can be checked without any hindrance. However, there may be a few circumstances where there may be a need to secure the airway, but leave the maxillofacial area clear. This was traditionally done by elective tracheostomy.

Advantages of a tracheostomy

- For ventilation and suctioning the airway, a small but secure access is provided.
- Drugs such as oxygen and or other nebulization medications can be delivered with greater accuracy through the access.
- When non-invasive techniques for ventilation become difficult due to bulbar involvement, a tracheostomy does become the method of choice.
- The maxillofacial area is relatively free of any bandages or straps to secure the airway and also has lesser chances of skin injury due to prolonged pressure injury.
- Most health care providers including the medical, paramedical staff are familiar with the tracheostomy care procedures.

The disadvantages of tracheostomy may be broadly categorized into the following three groups. peri-operative complications, early postoperative complications, delayed postoperative complications

- Peri-operative complications include hemorrhage, pneumothorax, pneumomediastinum, subcutaneous emphysema, esophageal injury, injury to the recurrent laryngeal nerve, and inadvertent blockage of the tracheostomy tube by clots or mucous secretions
- Early postoperative complications are accidental decannulation, infection of the trachea or around the surgical site. The trachea in itself may be damaged due to pressure from the tube; scarring due to infections or frictional injury to excessive tube movement•
- Delayed postoperative complications are the one that occur after a long term presence of a tracheostomy tube. There may be erosion of the trachea due to incessant friction called tracheomalacia. Tracheoesophageal fistulas may develop over time. There may be growth of granulation tissue around the tube, which may need to be excised before decannulation. Tracheal stenosis is a known complication usually occurring above the surgical site and may require additional surgery to correct it. The opening may not close on its own even after removing the tracheostomy tube. Usually seen if the tube remain in place for more than 16 weeks the area may not close on its own and may need surgical closure.

The second best alternative to doing an elective tracheostomy was to shift the tubes between the oral and nasal regions as when required. Howver, this has its own limitations like:

1. Increase in intraoperative time
2. Increases the operative costs
3. Risk of hypoxia remains between the time of shifting the tubes

4. Excessive laryngeal manipulation will cause laryngeal edema, which has its own problems during recovery.

To circumvent these problems many techniques have been tried like.

Retromolar intubation

First described by Bonfils in 1983, the retromolar space may be defined as retromolar intubation may be an option. The space is defined as that area between distal part of the last molar and the ascending part of the ramus of the mandible across the alveolar margin. But, the retromolar space may not be sufficient in all adult patients and the space available may not be similar on either side due to the differences in development times of the third molars and either of the side and may be used to rest the endotracheal tube when the third molars are absent.[2] Mertinez-Lage *et al*. have used the retromolar route for securing the airway in 39 patients requiring craniofacial and orthognathic surgeries, in 1998. This technique is simple, atraumatic, and fast, which also permitted monitoring intraoperative dental occlusion, while keeping the tube patent.[3]

Submental intubation

Hernández Altemir F first described the use of submental intubation as an alternative route to secure the airway through oral or nasal intubation.[1] This is a viable short term alternative to elective tracheostomy, in situations where both oral and nasal route intubations were not feasible. This technique give the advantages of nasotracheal intubation, which allows intraoperative checking of dental occlusion, and just as in an oral intubation gives unrestricted access to the frontonasal areas. The risk of meningitis is eliminated, and complications such as tracheal stenosis, injury to cervical vessels or the thyroid gland, associated with tracheostomy are circumvented.[4] However, this technique is best applied where the anatomy would be restored after the surgery and the need for prolonged postoperative ventilation is not warranted.

Trans mylohyoid intubation (submandibular region)

Gadre and Waknis[5] described transmylohyoid as more appropriate terminology for any modification of the submental intubations. In this variation, the endotracheal tube passes through the mylohyoid at any point between the first mandibular molar to the anterior border of the ramus, instead of limiting it to the submental region.

The use of two tubes one used via a regular oral intubation and the other inserted via a retrograde fashion is claimed to be superior as it decreases the chances of hypoxia when difficulty is encountered in retrieval and also, need of detaching the connector is eliminated.[6] After oral intubation with a regular tube, another flexometallic (reinforced)tube is introduced through the submental incision to the oral cavity and is negotiated into the oropharynx with a McGill forceps. At this point, the regular orotracheal tube is pulled back, and the submentally introduced flexometallic tube is negotiated into its place.

Hanamoto *et al*. used the barrel of 10 cc syringe, which was passed through the extraoral incision into the oral cavity. By connecting the distal end of the oral tube with the proximal end of the retrograde tube which was passed through the submental incision ventilation was possible even during re-routing.[7] Introduction of infection to lower airway remains one of the drawbacks of this retrograde technique, which may be from the contaminated balloon passing through the incision while extubating. Lima *et al*.[8] in their study utilized a cut sterile surgical glove finger to cover the proximal end of the tube, to prevent the entry of blood and macerated soft tissue. Adeyemo *et al*.[9] proposed the use of a nylon tube sac to cover the tube.

Special situations arise such as cases of laryngotracheal disruption, patients who refuse endotracheal intubations due to professional considerations and in maxillofacial trauma case with associated unstable cervical fractures where, the submental intubation has also been used with a laryngeal mask airway (LMA)along with a flexometallic tube.[10] However, when using the LMA care must be taken to prevent inadvertent dislodgement during the procedure.

All these techniques traditionally aim at leaving the maxillofacial area free of the tube and help in checking occlusion intraoperatively. Our experience has been primarily with transmylohyoid intubation (submandibular region). "Rule of 2-2-2" – where a 2 cm long incision is placed, 2 cm away from the symphysial midline, 2 cm away from the medial border of the mandible and keeping it parallel to the mandibular margin as described by Nyárády *et al*.[11]

Our trauma cases were mostly Lefort I and II combined with Mandibular fractures. In those patients where there were symphysis fractures, we kept our incision in the submandibular region and avoided stripping the periosteum. Gadre and Waknis[5] noted that in patients with comminuted fractures in the symphysis and parasymphysis regions, the conventional submental technique will necessitate consequential stripping of lingual periosteum that will be detrimental to the blood supply of the smaller fragments.

A paramedian approach may sometimes injure the submental vessels and excessive bleeding may be encountered. MacInnis and Baig described the use of the midline incision in order to avoid this.[12] An incision in the midline would dispense with the risk of inadvertent injuries to the lingual nerve, submandibular duct and sublingual gland.

Another advantage of the midline technique is where the surgeon can utilize the relatively avascular plane that exists

between the two bellies of the digastric. The incision heals without much scarring and is supposed to be more acceptable cosmetically.[13]

In the orthognathic surgery series patients were explained of the potential complications including the scarring as it was a cosmetic procedure. Both male patients required bimaxillary osteotomy and the female patient required a genioplasty and a rhinoplasty as a secondary corrective surgery.

The average reported time to complete a submental intubation was 9.9 min, but we have averaged about 17 min.

Complications as reported in the literature include superficial skin infections, damage to the tube apparatus, fistula formation, right main stem bronchus tube dislodgement/obstruction, hypertrophic scarring, and accidental extubation in pediatric patients, excessive bronchial flexion, lingual nerve paresthesia, venous bleeding, mucocele, and dislodgment of the throat pack sticker in the submental wound.

We have not encountered any major complications as described. There were minor instances of bleeding before the tube was externalized, but there was no risk of aspiration or hypoxia was the oral airway was firmly secured. In cases requiring genioplasty or cases of symphysial fractures the midline approach is best avoided as the tube may be damaged during the osteotomy using the saw/bur. Furthermore, the tongue space is occupied by the tube and prevents easy closure and IMF intraoperatively.

In our series, we have had a case of injury to the marginal mandibular nerve, which recovered in 3 months postoperatively. We feel that the rare complications associated with submental intubation are attributable to errors of surgical technique. The only negative response to the technique has come from the anesthetists who complain of difficulty to suction the patient through the armored tube, while it is still in submental position.

Conclusion

The transmylohyoid intubation technique gives the surgeon and the anesthetist comfortable control over their respective domains. While giving the advantages of oral or nasal intubation, it gives the surgeon a clear field in selected complex craniofacial injuries where occlusion is important or in facial plastic procedures where distortion of the surgical area due to a tube is avoided. Although it demands some surgical skill, the learning curve is not very steep and is simple and easy to learn. No specialized equipment is needed makes it even more acceptable.

Its efficacy in elective procedures and emergency procedures has been proved beyond doubt without significant morbidity to the patient while not adding much to the overall operating costs.

To conclude this technique therefore, when used in cases with proper indication, gives both the surgeon and the anesthetist a chance to deliver a better quality of patient care.

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